ORTHOPEDIC DEFORMITIES

OF

EARLY CHILDHOOD.

BY

CHARLES F. STILLMAN, M.D.,

NEW YORK.

Reprinted from THE AMERICAN JOURNAL OF OBSTETRICS AND DISEASES OF WOMEN AND CHILDREN, *Vol. XV., No. III., July*, 1882.

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PAPER NO. I.

UNDER this heading are comprised a class of cases which come mainly under the notice of the practitioner or family physician, and as the best results are to be obtained from early treatment the object of this series of papers is to place their management in a practical light.

1. *Infantile Talipes Varus.*—This condition presents certain characteristic appearances, the anterior portion of the foot being twisted upon the posterior, and the foot, as a whole, being twisted inward at the ankle, the articulation of the os calcis and the astragalus—the heel being elevated. See Fig. 1.

The first thought which comes to the mind of the observer is in regard to the advisability of an operation. It would seem as if tenotomizing the muscle would restore symmetry at once, without recourse to more gradual means. And the division of these tendons without delay is held by the great majority of surgeons to be the proper course indicated; for the immediate effects of such an operation are brilliant in the extreme and most satisfactory to the parents, the foot becoming easily restored to its normal relations with the limb and with itself, and it is then bound down to some splint, which affords support during union of the tendons.

The after-effects of this operation, however, are very disappointing in many instances, being succeeded by relapses into the original condition for which the operation was performed. And, while I am not one of those who condemn the practice in toto, I do contend that it should be only considered as a last resort, after everything else has failed.

We must bear in mind that most of these cases of congenital club-foot occur in children in whom there is deficient nutrition and development of muscle. By tenotomy a muscle becomes permanently weakened through the absorption of its structure after retraction has followed the division of the tendon and consequent separation of its divided extremities. And there exists a manifest impossibility for the muscle to entirely regain what it loses by such absorption. The question should then present itself to the mind of the physician: Is this limb in such an ex-

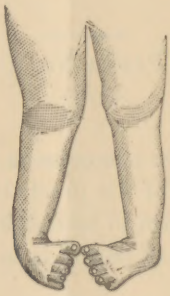

FIG. 1.

cessive state of muscular development that it can afford to part with a portion of its strength permanently? If you can satisfy yourself that such is the case, tenotomize; but an error of judgment in this regard is sure to bring down future anathemas if the operation be not permanently successful.

Some of the most marked cases of pedal deformity that have come under my observation have resulted from the abuse of tenotomy, or its employment when contra-indicated. It is, as a general thing, better for the patient and for the doctor to first exhaust every procedure which mechanical science can devise rather than resort to the knife; for, if injury be done through its use, it is almost irreparable.

It would seem, even to an unpractised mind, that it would be preferable to stretch the stronger and contracted muscles, and

thus relax the weaker, which are appropriately invigorated by treatment, until both become equalized in power, after which distortion becomes impossible. Before cutting the stronger muscles to reduce their strength to that of the weak, which are already too feeble to properly perform their functions, many prefer to try other means; and as the instructions laid down in the various text-books for the treatment of infantile club-foot are not sufficiently explicit to be of much use to the busy practitioner, it is principally my present object to supply this deficiency.

After thorough examination the foot should be taken in the hands, and gently *untwisted* as much as possible. This at first must be done cautiously, for the foot will be seen to turn white from interference with its circulation. I use the word "untwisted" advisedly, because a club foot is a twisted foot. Its curves are those formed by several twists combined, and any force used to reduce such a deformity must be employed carefully, and with this condition in view; not as if there were sharp angular bends which merely need the employment of a direct force to effect reduction.

At the same time that the foot is being *untwisted*, it should be *stretched*, the heel being drawn down. It will surprise those who have not thus handled a case to notice the readiness with which even very marked ones yield to successive manipulations by the hands, when they are educated to combine untwisting, stretching, and pressure together, or, in other words, untwisting, pulling, and pushing.

The pressure, or pushing, part of the process is exercised upon the protruding tarsus; but this must be done cautiously, and in conjunction with the untwisting and stretching, the latter tending to prevent the contiguous surfaces, which in children are more easily bruised than in adults, from injuriously pressing upon one another during the operation.

Our object is to place the foot in its normal relations, and, as this rarely is attainable or advisable at one sitting, we must employ some means of securing until the next attempt, such progress as may have been made. In young children this is best accomplished by the use of a strong twilled adhesive plaster and plaster bandage. A strip of such adhesive plaster about an inch in width is passed over the instep, down the inside of the foot, across the arch, and up the outside, and after being drawn upon,

is firmly fastened to the limb just below the knee, as in Fig. 2. A Y-shaped piece of the same material is then placed on the outside of the foot to approximate the heel and anterior portion of the foot, as in Fig. 3.

We will suppose that, as a result of the application of these plasters, the foot has been brought into and retained in as nearly the normal position as possible. A thin plaster of Paris bandage is now to be passed rapidly around the foot and leg all possible stretching of the foot being practised during the setting of the plaster. See Fig. 4. The principle which governs the stretching of the foot during the setting of the plaster is the same as that which governs the stretching of the back during the application of the spinal jacket for curvature of the spine. Extension is rigidly secured; and in the foot the contiguous

FIG. 2.

FIG. 3.

FIG. 4.

surfaces, in the altered relations which they have just undergone during the untwisting, are thereby prevented from being pressed together too severely, as they otherwise would be, by the action of the now irritated muscles.

It may seem a complex procedure to practise this untwisting, but it is infinitely preferable to an unsuccessful tenotomy.

About a week should intervene between these attempts at untwisting the feet, to allow the subsidence of any slight irritation which may arise. The reduction of the protruding tarsus is the most difficult and delicate part of the procedure. The pushing is usually done with the thumbs, very gently, while an assistant stretches and untwists the anterior portion of the foot on the posterior.

To effect this reduction nicely, and without much pain, it is necessary, as said before, to practise stretching at the same time ;

for it is only as the rest of the foot approaches its normal relations that the tarsal bones are suffered to assume their proper positions.

Among other methods of retaining the infantile foot in a corrected position, may be mentioned the use of perforated felt. This is to be obtained either in sheet form or, what is more convenient, in pieces already moulded to the normal infantile foot (see Fig. 5), and the latter can be used in one of two ways.

It may be dipped in hot water, and then applied while soft, hardening in a few moments, the foot meanwhile being held in as nearly normal a position as possible. The splint is secured by a few turns of adhesive bandage. Or the foot may be placed directly in the splint, and fastened in it as firmly as pos-

FIG. 5.

FIG. 6.

sible. But the latter plan is apt to cause discomfort, and is not so effective.

The principle which governs the use of the plaster-of-Paris or felt splints in *infantile* club foot is the resistance which the inherent stiffness of the material opposes to the tendency of the foot to resume its original position. At first, the foot is placed in as good position as possible, and held there rigidly until it has become adapted to its changed relations, when it is put in a little better position, and again held securely, and so on until with the forces applied the deformity has been obliterated.

By some the use of strips of adhesive plaster alone is advocated, but it is not a sufficiently firm dressing to prevent the foot twisting on itself, nor does it allow the *stretch* to be secured, which is important for the comfort of the patient.

When the foot has become so far reduced that it can readily be placed in nearly the normal position, one of the little shoes

that children wear may have a spring attached to its side (see Fig. 6) so as to oppose the tendency to twist inward, which, of course, the foot still retains if the plaster or felt be left off.

This spring is articulated opposite the ankle, and may be placed internally or externally, as the surgeon desires. In either case, however, the inclination at which it is attached to the shoe should be such, when the girth is buckled, as to turn the outside edge of the foot upward. See Figs. 7 and 8.

This simple device will be found very effective for the twisting inward of the foot, and if in addition a rubber strap be added, running from the side of the little shoe to the spring, inversion will be still more opposed; for the effect is to twist the anterior portion of the foot outward as well as upward.

FIG. 7. Pushing Spring.

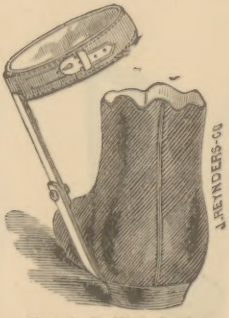

FIG. 8. Pulling Spring.

And as the little flexible soles follow the surface of the foot very closely, it acts as a very nice, light, and manageable club-foot shoe for infants, Fig. 9.

Another elastic cord may also be added from the girth to the shoe (Fig. 9), which will act against the contracted posterior muscles and tend to depress the heel as well as twist and hold the anterior portion of the foot upward.

But when these rubber cords are used, it becomes necessary to carry the side strip of the brace up to a point just below the knee, terminating there in another girth which is to be fixed immovably on the limb by a strip of adhesive plaster, the extremities of which button on the girth, as shown in Fig. 10. If this girth be not so fixed, the rubber cords will pull the side strip and girths around toward the toes and thus neutralize the effect. And besides, by turning the side strip, they convert the joint opposite the ankle into a lateral instead of an antero-

posterior joint, and thus take away even the lateral support of the spring strip. So that it must always be borne in mind, when elastic cords are used, to fix the girths on the leg immovably, just below the knee.

It is important in very young children to have nothing upon the foot which will annoy or give pain, and it is also important to avoid weight.

A shoe prepared in the manner I have described possesses these qualifications, and is in a marked degree applicable to these cases. And, as the mother is usually only too glad to provide a pair of the baby's shoes for such a purpose, any good

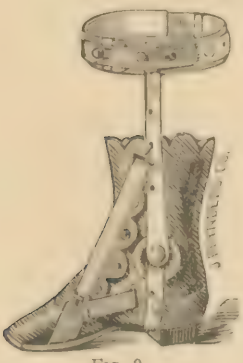

Fig. 9.

Fig. 10.

instrument maker can easily add the attachments. Without the spring at the side, however, in these cases, I do not consider the addition of rubber cords of much advantage.[1] Even though by these procedures we have apparently produced a relief of the condition, yet it cannot be considered cured until the child has begun to walk, or at least to stand; and this introduces a new factor into the case which is of the utmost importance, *i. e.*, weight.

The weight of the child is the most important agent in effect-

[1] For older children, the side spring strip, instead of being rigidly attached to the shoe, should be connected to it by means of a pivot below the foot in the centre of motion. This allows the elastic power to be used to greater advantage without impeding the normal motions of the foot. It also avoids the necessity for a transverse division of the sole opposite the mediotarsal articulation, with its obvious disadvantages to comfort and cleanliness.

ing a cure of the condition under consideration that we have, if rightly employed.

It needs but a moment's reflection to understand how the constant reception of twenty-five or thirty pounds upon a malplaced foot would increase the deformity, and, on the same principle, if the foot can be so placed as to receive this weight in nearly its normal position, the constant application of the force would tend to press out the deformities. To utilize the weight of the body as a curative factor in the treatment of infantile club-foot it is necessary for us to use spring power;[1] and this spring power may be either pulling or pushing in character, and formed of thin metal, or rubber, or allied elastic material.

It must be plainly understood, however, in the treatment of these cases, that the weight of the body should not be borne upon the foot until its axis be at its normal angle with the leg when the patient stands.

In the majority of cases the combination of elastic straps and the metallic spring, already described, will be sufficient to keep the *infantile* foot in position to receive the weight of the body, and will assist such weight to complete the cure.

If any of the club-foot shoes, which are provided with split soles and uprights on both sides of the ankle, be used for such young children, their weight and general unwieldiness imposes an impediment to the proper movements of the feet, and are apt to do more harm than good unless employed by those specially expert in their use; and for that reason, perhaps, severe cases, if not tenotomized, are often allowed to go on uninterruptedly until advanced childhood before relief is sought.

[1] Sayre (Diseases of Joints) recommends the use of Barwell's apparatus, but the application is complex and embodies a dangerous principle in orthopedics: that of covering muscles which are in use. To apply and hold the tin plates which act as the staples for the insertion of the elastic cords, it is necessary to encircle the calf with plasters which tend to obstruct the free play of the muscles beneath, and their nutrition, too, is thereby impaired.

It may perhaps be argued that the fixation of the foot and limb in plaster-of-Paris or felt, during the preliminary reduction of the deformity, is open to the same objections, but the fact, that this encasement is used before the weight is borne upon the limb is sufficient to controvert this. I see no particular objection to Barwell's apparatus beyond its cumbersomeness and the tendency of the plasters to slip if used before the weight of the body is borne upon the foot: but after walking is begun I am not in favor of its use, for the reasons above-stated.

Almost all cases of congenital club-foot should receive the benefit of spring power at the time that walking commences; and if they do not receive this, no matter how well the foot may have been manipulated up to this time, relapse is almost sure to occur. This is, indeed, the critical time for treatment of club-foot, and I cannot impress it too strongly upon my readers; for if the foot be now so placed and held that the weight is received normally, every step and every jump of the child tends to cure the malposition permanently; while if such be not the case, if the foot be turned inward in the least beyond the normal angle,

FIG. 11.

every step and jump will serve to increase the deformity, and render it more difficult ever to overcome.

A condition often found associated with talipes varus in young children is that of GENU-VARUM OR BOW-LEGS.

This is another of the deformities of early childhood requiring prompt treatment. It is so common a condition, and brought so prominently to the notice of every practitioner, that an extended description of the deformity would be out of place here. It

will, therefore, be sufficient for our purpose to notice, as its prominent feature, that the weight of the body is borne by the limbs, not perpendicularly, but, as its name implies, in a bowed line; the knee being outside the perpendicular passed from the hip to the ankle. If a bow be placed upright, as in Fig. 11, considerable downward pressure would be required to produce a curve while the straight line is preserved; but when this has yielded, the vertical distance A B becomes less in proportion as the curve increases, and the greater the curve the less downward pressure is required for its increase. If the human

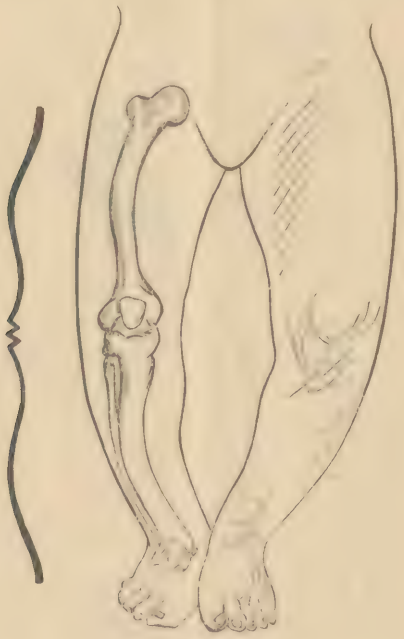

FIG. 12.

frame be erect the leg may be compared to such a bow with a weight placed at its upper end. So long as the bow is of sufficiently stiff material to sustain the weight curving does not take place; but if it is weak and yielding, gravity draws the weight at A toward the earth at B, and in doing so, curves the bow in the direction of the least resistance. So it is with the human leg. The weight of the body is best borne upon an upright limb; but if, through impaired nutrition or develop-

ment, the bones are not of sufficient inherent strength to offer this erect resistance, a curved condition results.

The direction of this curve is lateral and outward, and is often associated with secondary curves. Were the arc of resistance equal at all points the centre of the bow would be opposite the knee-joint. But the structure of the joint is such as to cause the limb to form, instead, a double curve, the upper part of the femur being perceptibly convex outward, and the lower part convex inward; the tibia above being convex inward, and below convex outward. By a glance at the appended diagram it will be seen that the bones of the limb are, by these curves, given the appearance of a double bow, the knee joint itself not being bent to any great extent. Fig. 12.

The rarity with which the epiphyseal relations are interfered with in this condition is noticeable, and is, perhaps, explainable upon the hypothesis that the hinge-like formation of the knee is so perfect, and the lateral ligamentous supports so complete, that the weight of the body is not sufficient to displace it outwardly; and, consequently, the femur above and the tibia below give way near the centres of their shafts, thus forming double curves very much resembling in their shape the bow depicted in the figure.

It is important to locate the centre of curvature in the tibia and femur, since it is at those points that the force must be exerted which is to press the limb back to the perpendicular line.

This, in young children, is accomplished through the medium of spring power—such as I have already detailed when treating of talipes varus.

It is important, with children, to avoid cumbersome apparatus of any kind, fixed force being particularly disagreeable and even injurious to their yielding frame.

Now, spring power may be utilized easily and perfectly for the cure of bowed legs in the following manner, and the apparatus will be found free from the defects of weight, rigidity and difficulty of wearing. Four girths are provided, made of thin steel (Fig. 13), whose extremities ride into one another, so as to admit of variation of their circumferences, and yet preserve a stiff, circular form, which will not draw upon the soft parts so as to interfere with the circulation or cause discomfort. This they are more apt to do if formed simply of leather, or padded in the usual manner.

These girths are to be placed on the limb at the centres of the curves already described, and are connected by a thin strip of steel which runs down the outside of the limb, is articulated opposite the knee, and sprung into the form of a double bow, as shown in Fig. 13. It will be seen that this strip of steel corresponds in shape to the bow which is formed by the bones of the leg. But when applied these curves are placed reversely to the curves of the leg, centre against centre (Fig. 14).

This contrivance does not interfere with the motions of the limb, and exerts a constant spring force directly against the curvature, the power varying with the age of the child.

FIG. 13.

FIG. 14.

It is a very light, easily-adjusted brace, and seems to meet every indication.

It may be used also as a night splint, and, when in constant use, should be removed at least once a day to permit the muscles to be rubbed and manipulated.

There is one point relating to this condition of bowed legs which, it seems to me, has received too little attention from writers upon this subject, and that is, the malposition of the feet. Many of the cases which present themselves for treatment carry the weight of the body upon feet which are inverted, and almost in the state of talipes varus, and this seems to be

proportionate in many cases to the degree of curvature of the legs. It would seem as though the malposition of the foot might be attributed to insufficiency of the peronei muscles, due to an increased stretch upon them as the curve of the bone increases, followed by a secondary relaxation of the external ligaments of the ankle. An examination of the normal ankle-joint leads to the conclusion that its external ligamentous supports are so placed that, were it not for the supporting action of the tendons of the peronei, the ankle would be so relaxed as to be incapable of sustaining itself in its correct position. The peronei seem to be endowed not only with the power of everting the feet, but also of preventing them from turning under,

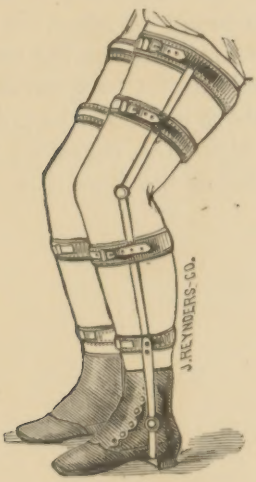

Fig. 15.

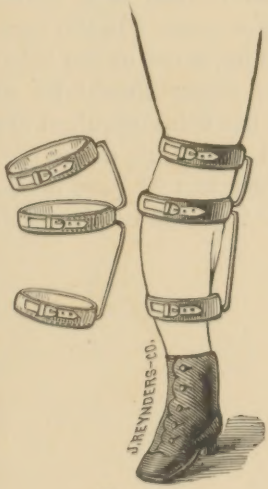

Fig. 16.

and of preserving the balance of muscular force which retains the foot at its normal angle with the leg. The external ligaments of the ankle, unassisted by the muscles, are not capable of retaining the foot at this angle, while on the inner side of the ankle the ligamentous structure is sufficient, of itself, to effect this.

The inverted feet accompanying bow-legs are, then, I believe, partially due to relaxation of the peronei; for in many cases of bow-legs where the muscular system is of sufficient development, and the peronei are of normal power, the foot is everted normally.

There is, however, a tendency in some cases to walk too much

on the inner edge of the sole—a fault we can, with some degree of certainty, ascribe to the reception of the weight of the body by the foot somewhat inside of its usual axis, and a consequent forced stretching of the internal ligaments. Talipes valgus is, therefore, occasionally associated with bow-legs, but not so often as varus. Perhaps the neglect of the proper appreciation of the importance of restoring the malplaced feet has had an important bearing upon the unsatisfactory results so often obtained in the treatment of severe cases of bow-legs.

To correct the malposition of the feet we add the lateral foot spring, already described under talipes varus, to the remainder of the bow-leg brace, as in Fig. 15, having the spring at the shoe so inclined as to throw the foot outward if it turn inward, and *vice versa*. If the curvature be found to affect the bones of the leg alone, or the thigh alone, as is sometimes the case, the spring power should be applied only to the part curved, the brace not being required to extend above or below the points of actual curvature, as in Fig. 16, in which the curvature being confined to that part of the limb below the knee, the spring power is placed on the inside.